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Colony of Seychelles.



ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR 1934.



Published by Command of His Excellency The Governor.



PRINTED BY THE HEAD PRINTER,
AT THE GOVERNMENT PRINTING OFFICE,
Victoria, Mahé—Seychelles.

1936.

of the

A. M. L. R. P. O. T.

of the

DEPARTMENT OF AGRICULTURE

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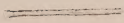
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STAFF OF THE AGRICULTURAL AND FORESTRY DEPARTMENT
SEYCHELLES.

1. Hon. F. L. Squibbs, Director of Agriculture.
2. L. Hoarau, Chief Clerk.
3. A. Houareau, Assistant Inspector of Plantations.
4. A. Gendron, Senior Forest Ranger.
5. E. Ethève, Forest Ranger, Praslin District.
6. A. Morel, Laboratory Assistant.
7. P. Sauvage, Junior Agricultural Assistant.
8. L. Albert, Storekeeper and Laboratory Attendant,
9. A. Tirant, Garden Foreman.
10. E. Azemia, Nursery Overseer.

Notes on above :

1. Appointed Director as from 5th March *vice* Mr. P. R. Dupont who left the Colony on leave prior to retirement on the 5th December 1933.
2. Transferred to the Department as from 16th August.
9. Left the Department June 1934.

SECTION I. AGRICULTURE IN THE COLONY.

(a) *Weather conditions.*

1. Appendices to this report give (1) meteorological return for the year, (2) the monthly rainfall taken at the Port Office, Victoria, for the 21 year period 1914-1934.

2. The year 1934 is memorable for the heaviest rainfall ever recorded in the Colony. Its total of 145.06 inches being over 50 inches above the general annual average. Its monthly distribution was high, the months of July, August and September being particularly abnormal with a total rainfall of 60.45 inches. Such a heavy record is particularly remarkable during a year when severe drought conditions were reported as occurring in many parts of the world. Although wet years are with reason alleged to affect the pollination and setting of the flowers of the coconut thus diminishing the crop returns during the following year, it may be claimed that its compensating advantages are (1) a reduced scale population and (2) a more liberal food supply for the palm trees which are thus enabled to recover some of their lost vigour.

(b) *Crop conditions.*

1. THE COCONUT INDUSTRY.

3. The following table taken from the Customs returns shows the quantities of coconut products exported from the Colony during the past six years :—

	1929.	1930.	1931.	1932.	1933.	1934.
Copra per ton	4,500	5,909	4,875	4,680	3,217	5,565
Coconut oil hect.	10	78	33	104	80	123
Coconuts nos.	242,600	...	45,717	80,000	46,658	200,762
Soap kilos.	...	...	...	...	600	3,442

4. Extremely low prices for coconuts and copra prevailed throughout the year and the following table gives the local price of coconuts and copra month by month. A rise in price will be noted as occurring towards the end of the year.

	Coconuts per 1000.	Copra per ton.
January	Rs. 9 to Rs. 10	Rs. 80
February	9	80
March	9 to 10	80
April	9 to 10	Rs. 72 to Rs. 75
May	9 to 10	75 to 80
June	9.50 to 10	82 to 85
July	9.50	82 to 83
August	10	85
September	10	82
October	10 to 11	88
November	11	95
December	15	110

5. In the report for last year, the writer enumerated the causes for the low coconut yields in Seychelles which may be summed up as being due to lack of proper cultivation and insect attack.

At the same time it is fully realised that low monetary returns during periods of depression hardly suffice to enable the planter to repair the omissions of the past by expenditure on manures etc., especially when it is realised that trees in a debilitated condition are not immediately responsive by way of increase of crop to treatment given. Until better methods are adopted yields will remain low and

pests and diseases will be ever present. It would seem, however, that before there is a general improvement in the standard of coconut cultivation in the Colony a radical change must take place to alleviate the financial burden of the majority of the Estates where the land is heavily encumbered with mortgages at abnormally high rates of interest.

6. The immediate hope for the future lies in the proposed establishment of an agricultural Land Bank which would have as its first object the loaning of money for the development and improvement of Estates and the capital expenditure necessary for the preparation of its produce for the market. Its second object would permit the mortgages to be taken over and ameliorate present rates of interest. In November an announcement was made stating that draft Ordinances had been despatched to the Secretary of State for approval.

2. ESSENTIAL OIL INDUSTRY.

7. The following are the quantities with values of Essential Oils exported during the year :—

	Kilos.	Values.
	—	—
Cinnamon Leaf oil	59,619	Rs. 194,581
Cinnamon bark oil	27½	1,110
Lemongrass oil	18	54
Patchouli oil	1,919	10,046

8. The exports of essential oils during the past five years were as follows :—

	1930	1931	1932	1933	1934
	—	—	—	—	—
Cinnamon leaf oil	Kgs. 50,476	54,793	49,669	60,681	59,619
Cinnamon bark oil	" ...	3	30	29	27½
Basil oil	" 23	12	3	...	...
Patchouli oil	" 2,341	3,915	2,424	614½	1,919
Lemon grass oil	" ...	...	...	...	18

Cinnamon bark was exported to the amount of 7½ tons valued at Rs. 338.

9. The export figures for Cinnamon leaf oil, the greater part of which is shipped to U. S. America, again attain an abnormally high level, but this is not due to the increased acreage under the crop, but rather to overcropping. It may be observed that in certain parts of Mahé the natural reproduction, growth and spread of cinnamon is being checked by the inroads of the bracken fern and the grass *Panicum Parvifolium* and there is but little effort made by planters in the areas affected to keep these weeds in check. Cinnamon grows wild, more especially on the higher slopes of the Island, but it is also found on the lower slopes among coconut palms. Regarding the latter, planters apparently prefer to leave the poor quality cinnamon growing in their healthy coconuts on the lower slopes rather than pay more attention to healthy cinnamon growing among poor coconuts on the higher slopes. Methods of cropping cinnamon still leaves much to be desired. Attention has been constantly directed to this end but with the present labour contract system of paying so much per ton of leaves to collectors, it is to be expected that the collectors will be indifferent to the manner in which the crop is reaped and to the treatment of the plants.

10. In 1933 the export of Patchouli dropped to 614½ kilos which was in the main due to the local buyers holding up the oil in the hope of a rise in value. The year under review, however, did not show a corresponding increase in exports. The prices obtained for the oil during the year was comparatively low which no doubt accounts for the lower output, it being stated by some planters that it does not pay to distil Patchouli at the prevailing prices. The plant is cultivated usually between coconut palms and is manured heavily with cinnamon leaf refuse.

11. All Patchouli oil prior to shipment is deposited at the Customs and under the provisions of the Patchouli oil Ordinance, a sample from each container of a consignment is taken for examination by the Department of Agriculture and tested, the test being for "Standard Quality", that is fit for export, and if being up to the required standard, a certificate to this effect is given to the exporter. No Patchouli oil is allowed to be exported without having been previously passed by the Department as being of "Standard Quality". This examination and testing is having beneficial results to the industry and a better quality of oil is being produced, but there is still room for improvement. A Proclamation under the Patchouli oil Ordinance was made during the year to include oils new to the Colony, such as Palmarosa, Lemongrass, Citronella and Eucalyptus citriodora.

12. *Eucalyptus citriodora*. A real interest is now being taken in this tree consequent to reports received as to the marketing possibilities of the oil. A later chapter records the numbers which were distributed to planters during the year and many planters have established nurseries on their own estates. Although the oil has not so far been exported in marketable quantities it is hoped that when this does commence a continuity of supply will be assured.

13. *Palmarosa*. The favourable reports on the oil distilled from the multiplication of the selection of six plants made in 1932 has added another string to the economic bow of the distillers of this Colony. The plants from the time of selection were propagated by division as rapidly as possible with the result that receipt of the report from the Imperial Institute found the Department with thousands of plants on its hands for distribution. To safeguard the purity of the strain an Ordinance was enacted during the year providing for the eradication of Gingergrass, a grass which closely resembles Palmarosa but yields an oil of inferior quality. This grass is stated to cross freely with Palmarosa and bears viable seeds and the necessity of the eradication of both Gingergrass and its hybrids is at once apparent. The danger has been realised by planters and it is pleasing to record that at the end of the year only three estates were reported as having Ginger grass growing, but owing to the high rate of seeding it is necessary to keep a watch for seedlings. A further provision was made to control the planting of the grass only to areas which were known to be free from Gingergrass. The Ordinance itself is an interesting piece of agricultural legislation.

14. *Lemon grass*. A fairly large acreage has been planted during recent months. The Seychelles variety is remarkable for its high citral content and apart from its oil value, the grass itself is valuable as a soil cover and its use for mulching.

15. In order to stimulate the planting and cultivation of *Eucalyptus citriodora*, *Palmarosa* and *Lemon grass* of the Petite Citronelle variety the Government has offered a substantial bonus for each litre of oil exported subject to being up to "Standard Quality". The decision covers a period until the end of 1935 when the question of its continuance will be reconsidered.

MINOR INDUSTRIES.

16. *Vanilla*. 482 kilos of cured beans, to the value of Rs 2,502, were exported during the year. The vine is grown mainly on Praslin, the second largest Island, where the same methods and technique survive which in the old days placed the Colony in a high position as a Vanilla producing country. These vanilleries show the capabilities of the Seychellois to understand and master the difficulties concerned with the cultivation and preparation of a comparatively difficult crop.

17. *Coffee*. Coffee planting continues to increase but previous plantings have not as yet made any appreciable effect on the coffee importations from other countries. Robusta, excelsa, liberia and arabica have all been planted in Mahé. Here again insufficient attention is given to the requirements of the plants or the cultivation. The plants usually being covered in green scale, unpruned and generally no attention given. It should be remembered by those who are planting under the shade of coconuts that while shade requirements may be met in this

way, serious competition for food materials takes place between the coconut and the coffee plant with the result that the coffee usually gets the worst of the encounter, is thereby weakened and easily falls a prey to its insect enemies. There appears to be no reason why local requirements of coffee could not be met by local production. 54,474 kilos of coffee were imported during 1934 to the value of Rs. 19,128.

18. Seeds of improved varieties of Areca nuts have been introduced and plants raised, for which there exists a keen demand.

19. The varieties of Pepper from Ceylon and South India are being propagated as rapidly as possible and are readily taken by planters.

20. 12,062 tons of guano, valued at Rs. 207,240 were exported during the year, but the stocks of available guano are diminishing.

21. The double coconut, Coco de Mer, is mainly produced in the Island of Praslin, one of the very few places where the palm grows under natural conditions. Nuts numbering 4,205 and valued at Rs. 3,816 were exported mainly to India and the Far East.

22. Tortoiseshell to the amount of 1,104 kilos, valued at Rs. 18,231 was exported.

4. FOOD PRODUCTION.

23. It is without question that more food crops could and should be produced within the Colony for local consumption. Such commodities as butter, coffee, dhall lentils, maize, onions are all capable of being produced in the Colony. Cattle thrive, but grazing is on the whole poor and propagating material of fodder plants is being introduced. In Mahé, beyond milk supplies, but little or no dairying is done, while the distance and absence of cold storage apparatus preclude the development of this useful sideline in the other islands. The seed and seedpods of dhall, the pigeon pea, is badly attacked in Mahé by insects, but there appears to be no reason why the plant should not be grown on other islands. Maize is grown to a small extent and the cultivation could be extended, and seed of improved varieties is being obtained for trial purposes.

24. Manioc, sweet potatoes and arrowroot are grown but both manioc and sweet potatoes are of inferior kinds.

SECTION II. WORK OF THE DEPARTMENT.

25. The Department is responsible for the upkeep and maintenance of (1) the Botanical Gardens, (2) the Public Gardens in the town of Victoria, and Hospital grounds, (3) the supervision of Government House grounds, (4) the Hermitage Estate adjoining the Botanical Gardens (and which is being developed by the Department as a nursery and experimental station), (5) the Coco de Mer reserves, Praslin, (6) the Crown Lands, (7) the following which are described in detail.

(a) *Botanical, Town and Hospital Gardens, and Government House grounds.*

26. The economy proposals made by the Financial Adviser during his visit the previous year did not aim at restricting the activities of the Department with regard to its purely agricultural work but the votes for the upkeep of the Gardens were appreciably curtailed. Consequently considerable reduction of the labour staff employed in the Gardens had to be made and wages were reduced all round. To maintain as far as possible the high standard of upkeep with the reduced staff, a large number of flower beds were done away with, and an increase of flowering shrubs was aimed at. This policy has proved to be entirely successful and the Gardens have in no way suffered, in fact judicious re-arrangement may be said to have considerably improved the general appearance, with a considerable saving of time and money involved in the raising of large numbers of flower seedlings for

the continual replenishment of flower beds. Great change and improvement were carried out in the Government House grounds. The gardens had been allowed to become overgrown and a large part of the grounds had reverted to bush conditions. With the aid of prisoners, this has now been cleared and planted with grass. The varieties of *Bougainvillea* received during 1933 from Ceylon have all flowered and are doing well. Mrs Butt being a particular favourite. Another recent introduction which is very popular is *Pentas coccinea*. *Cæmænsia maxima* flowered for the first time. The Botanical Gardens which have been laid out with considerable skill prove a great attraction to all visitors to the Colony.

27. (b) *Field experiments and demonstration plots.*

The value of field experiments and demonstration plots may be said to take first place for purpose of agricultural education and propaganda. It is possibly the only method of appeal to the practical man (especially in an isolated Colony like Seychelles). It is the chief method by which the lessons of draining, alignment, spacing, intercropping, use of shade, soil selection and management and the detail and method of scientific cultivation can be taught and assimilated. This is apart from the experimental value to be gained from such work.

28. The lack of these experiments has proved undoubtedly a serious drawback to general agricultural advance in the Colony. No doubt there have been difficulties with regard to obtaining a suitable experimental station, but the facilities for such work on the Hermitage Estate which adjoins the Department are now being made the most of, and considerable progress has been made during the year. But the Hermitage Estate, unfortunately, is not sufficiently large to permit of its use for the experimentation with the Colony's major crop, viz. coconuts.

29. The Department needs a fairly large area of land with soil conditions approximating to the coconut soils of the Colony for manurial experiment and the establishment of blocks of trees grown from selected seed. The latter would be considered a long range experiment but such long range experiments are essential to the industry which will probably remain the staple crop for many generations to come.

30. The first plot on Hermitage Estate was a Citrus plot planted in 1933 and consists of 24 trees in 6 rows planted at a distance of 25 feet apart. The trees which were obtained from South Africa and are the first commercial varieties of Citrus obtained and planted by the Department. The varieties chosen were:— Grapefruit; Marsh seedless and Triumph, Lemon; Eureka and Sicilian, Oranges; Washington Navel, Valencia and Jaffa. Although these trees were planted out on a practically abandoned and worn out piece of land, a careful and generous treatment, using the inter-spaces for Nursery purposes is gradually bringing the soil into good heart and the trees are making good growth. These trees must perforce furnish the Department's supply of budwood as the many importations from Zanzibar and South Africa have hitherto failed to arrive in good condition. There is great local need for oranges and grapefruit of good varieties, and the possibilities of supplying the Bombay market with grapefruit have already been advanced by the Agricultural Adviser, Mr F. A. Stockdale.

31. Commencing in December 1933 the abandoned land on the Hospital side of the main drive was cleared for the purpose of experimental plots and by the end of the year the following had been aligned, drained and planted.

32. *Coffee and Nutmeg plot.* The area chosen was a sloping piece of land admirably lending itself to contour draining. The permanent crop being Nutmeg, four rows were possible at 20 by 20 feet apart. The plants were raised from the large seeded type, the seed having been procured from Ceylon, and two plants were planted in each hole at 18 inches apart. A shallow drain was made between each row. It was interplanted with Robusta coffee and between each row *Gliricidia* posts were regularly planted for the purposes of shade and a green draining of *Crotalaria* sown to afford quick shade to the young plants. The plot thus furnishes

the first example of regular planting, draining, use and method of shade and intercropping. Bordering one end of the Nutmeg plot two rows of Allspice trees (*Pimenta Officinalis*) divide the plot from a plot of the large seeded variety of the Areca Nut. This variety known as Hamban Pawak was obtained from Ceylon. A light shade of Gliricidia has been set out and the plots interplanted with the West Indian Lemongrass (*Cymbopogon citratus*). On the opposite side of the small ravine and occupying nearly the whole length of the main drive, plots of the following were laid out on the freshly cleared land. These plots which border the main drive have greatly improved the appearance of the Gardens and are well situated to catch the eye of all who visit the Gardens.

(1) Mango plots consisting of named varieties received the previous year from Ceylon, planted 30 feet apart and interspace used for Nursery work.

(2) *Eucalyptus citriodora* planted 10 by 6 feet with drains between each row and lemongrass planted as intercalary crop.

(3) *Eucalyptus staigeriana* (an Eucalypt. producing an oil of 16% citral content) was planted out 10 by 6 feet and interplanted with *Palmarosa*.

(4) Plot of four varieties of Sisal interplanted with pineapples.

(5) Plot of citrus.

Another plot of *Eucalyptus citriodora* was interplanted with *Derris malaccensis* and *elliptica*.

23. A trial was made of sowing *Eucalyptus citriodora* direct into beds. This method was only partially successful but sufficient plants survived to furnish the beds.

34. It is hoped gradually to convert and devote the available land on the Hermitage Estate to experimental plots.

Cinnamon Experimental Plot.

35. A plot was selected in the Cinnamon reserve above the Gardens and divided into 3 subdivisions. The first was cut down to ground level and the stumps lightly covered with soil. The second was cut down to the local normal pruning height and the ground hoed. The third was treated in the same way as No. 2 but manured at the rate of 2 lbs cotton seed meal per clump.

Onion trials.

36. The Department again demonstrated that Onions can be grown successfully in the Seychelles and the varieties Bermuda White and Red and another called Crystal Wax produced good crops. To encourage the cultivation of this crop a leaflet was published and circulated and a quantity of seed was obtained from Teneriffe and distributed free of charge.

Cover crops etc.

37. Trials were made with the following of which the seeds were imported from Ceylon and Morogoro:—Cowpeas, *Phaseolus mungo*, *Pueraria* and *Crotalaria anagyroides*.

Beans.

38. A dozen varieties of edible beans received from Kenya were tried but unfortunately did not succeed owing to heavy rain. Soya bean was introduced from Ceylon and grew successfully.

Citronella and Lemongrass.

39. An interesting investigation into the "melange" of Citronellas and Lemongrass growing in the Colony was concluded during the year. Various varieties of these grasses had been introduced over many years and a fairly extensive acreage was established on Bel Air-Sans Souci ridge and on the Barbarons Estate. With the plants found in the Botanical Gardens as many as 12 types

were identified. With two exceptions all produced enough material to enable a sufficient quantity of oil to be distilled from them and for the samples to be sent to the Imperial Institute for analysis. In addition to oil samples dried specimens of each type were submitted to the Imperial Institute who in turn forwarded them to Kew. A report on these specimens follows later. A plant of each type under its number is maintained in the Botanical Gardens and makes an interesting study. Of the 10 examined only 3 seem to be worthy of further interest from a planter's point of view, one being the "Petite Citronelle" yielding a Lemon grass of good quality and the other two citronellas with an oil analysis approximating to the commercial oil known as Ceylon Citronella. The large estate plantings at Barbarens and Bel Air produced oil said to be of very poor commercial quality.

(b) *Manurial Experiments on Estates.*

40. In accordance with the recommendation of the Agricultural Adviser to the Secretary of State for the Colonies, a grant was secured from the Colonial Development Fund to provide for experiments with organic fertilisers for manurial experiments on Estates.

41. The manures for these experiments arrived early in 1932 and altogether 19 series were commenced. Six of these experiments were discontinued, three by the owners after receiving the second year's supply of manures. With certain exceptions there has been a lack of interest taken in these experiments and unfortunately this was reflected in the lack of cultural attention necessary to have accorded the manures a fair trial. This lack of interest may be partly due to unfamiliarity with the use of manures and failure to realise the possibilities of soil and crop improvement by systematic manuring, and partly owing to the institution of these experiments during a period of severe trade depression. The crop returns from the 12 experiments which received their 3 years manuring show in the aggregate an increase of yield over the whole period. It is noticeable however that where severe scale attack has been recorded a decrease in yield is shown in the records for practically all plots which seem to show that manures in moderate quantities do not altogether counterbalance the effect of the incidence of these attacks. However manuring over several years would build up resistance in the trees and at least reduce the effect of these visitations.

42. Full record of these experiments would be too bulky for this report and it may suffice to summarize the experiments on the St. Roch Estate from the valuable records which have been kept by its enthusiastic owner.

SITE OF PLOTS. SANDY FLAT AREA NEAR THE SEA.

Manurial Treatment.

Year.	Month.	Treatment.
1932)		
1933)	March	Plot A.
1934)		400 Kilos of Fish Manure.
		(1 Acre)
1932)		
1933)	"	Plot B.
1934)		400 Kilos of Cotton Seed Meal.
		(1 Acre)
1932	"	Plot C.
		400 Kilos Bone meal ;
		1,000 Kilos Guano.
		(1 Acre)
1933	"	400 Kilos Bone meal,
		1,000 Kilos Guano.
1934	"	400 Kilos Bone meal,
		400 Kilos Guano.

Year.	Month.	Treatment.
	March.	
1932) 1933) 1934)	Plot D. (1 Acre)	Control. Clean weeded.
1932	Plot E. (1 Acre)	400 Kilos Cotton seed meal. 1,000 Kilos Guano.
1933		150 Kilos Sulphate of Potash. 450 Kilos Husk Ash.
1934		400 Kilos Cotton Seed meal. 400 Kilos Guano.
1932) 1933) 1934)	Plot F.	52 acres for climatic factor estimation. Kept under grass and cattle.

Crop returns.

	No. of palms.	Crop 1932	in 1933	nuts 1934.
Plot A.	44	459	606	862
„ B.	45	723	633	1,127
„ C.	43	439	482	1,038
„ D.	54	1,653	2,233	1,945
„ E.	50	994	711	1,528
„ F.	3,796	95,944	84,068	97,710

43. The Honourable Mr. Bailey writes as follows:—

“As I expected, no real result would show up in these experiments during the first eighteen months or so, but when you come to compare the third year yields with the first year when the fertilizers were applied you will note that the increase is very great indeed, except for perhaps the Fish in Plot A, so the full experiment is going to prove extremely interesting to us all.

44. As regards Plot F for the estimation of the Climatic and other factors to govern the fertilizer plots at the end of the complete experiment, the following will still further act as a guide.

Plot.	Year.	Rain in inches locally.	Yield.	Average per palm.	Average per bearing palm.	Average per acre of 73 palms.
F.	1930	97.15	108,307	28.5	31.2	2,083
	1931	82.21	100,368	26.4	28.9	1,930
	1932	73.05	95,944	25.3	27.6	1,845
	1933	98.94	84,068	22.1	23.8	1,617
	1934	148.25	97,710	25.74	27.10	1,879

The above plot contains 3,793 palms of all ages, or an average of 73 to the acre; at the moment 3,603 are in bearing. Plot D Control (Clean weeded) was nearly free of scale insects attack when the experiment started in 1932; it was quite free in 1933, but 1934 shows the scale returning; a very slight improvement is noticed in the attack of scale during the past three years in the 52 acres (Plot F), but scale is now rapidly disappearing from Plots A, B, C and E, and I expect a still greater increase in the nuts from these plots for 1935."

Manufacture of manure from distilled cinnamon leaves.

45. This important experiment was commenced to investigate means of causing the early breakdown of distilled Cinnamon leaves by treating them on the lines of the Adco and Indore methods. The importance of this experiment is of peculiar agricultural value to this Colony as without treatment distilled Cinnamon leaves usually take a long time before sufficiently rotted to be of use, and in consequence, huge stacks of leaves accumulate outside the distilleries or are used in a much too fresh condition. It is possible that the slow breakdown of the leaves is due to distillation removing the larger part of the pentosans or sugars essential as food for the micro-organisms that can break down the more resistant parts of the material.

46. Three heaps of freshly distilled Cinnamon leaves were made and treated as follows:—

No 1. 2nd March 1934.

5 tons freshly distilled Cinnamon leaves.

Treatment per ton:—Sulphate of Ammonia 25 kilos.

Guano	25	"
Lime	15	"
Pen manure	50	"

No 2. 20th March 1934.

3 tons

Treatment per ton:—Wood ashes 25 kilos

Guano	25	"
Lime	10	"
Pen manure	50	"

No 3. 10th March 1934.

3 tons. Control. No treatment.

47. In experiment No. 1 the material was built up by half ton layers and the Sulphate of Ammonia and Pen manure would be followed in the succeeding layer by the Lime and Guano. Similarly in Experiment No. 2 the lime and guano would be followed by the distillery ash and pen manure. Each heap was watered daily and temperatures of the heap recorded. After two months it was plainly noticeable that the treated heaps showed quicker rotting. Although it was regretted that it was not possible to carry a quantitative examination to ascertain the degree of humification of each lot over a given period, samples from each heap were sent to the Imperial Bureau of Soil Science, Rothamstead Experimental Station, and the report on the analysis and results are given below.

48. Some delay occurred before the samples were taken which may have affected the result. These experiments are sufficiently important to warrant their continuance as it is necessary for planters to realise the manurial value of their Cinnamon leaves as manure in its earliest and most valuable form:—

Cinnamon Leaf Soils, Seychelles.

49. The samples consisted mainly of decomposed leaves, sample No. 3 appearing to be less decomposed than samples Nos. 1 and 2.

Results of Analysis.

50. The analyses are also shown calculated to a moisture-free basis for the purpose of comparison.

	Sample No 1.		Sample No 2.		Sample No 3	
	as received.	Moisture-free basis.	as received.	Moisture-free basis.	as received.	Moisture-free basis.
	%	%	%	%	%	%
Phosphoric						
P ₂ O ₅ anhydride	0.60	1.56	0.62	1.85	0.08	0.31
Potash K ₂ O	0.024	0.063	0.064	0.191	0.028	0.109
Nitrogen						
(Total) N	0.71	1.88	0.71	2.12	0.71	2.77
Ammonia N.H ₃	0.008	0.021	0.005	0.015	0.004	0.016
Moisture	63.13	...	66.49	...	74.31	...

(a) *Plant propagation and Nursery work.*

51. From the table given below with a comparison of the distribution for the previous year, it will be seen that considerable expansion has taken place with regard to this important service. It now forms one of the principal activities of the Department. The almost trebling of the previous year's figure has been due to several factors, chief of these being :—

(1) A grant for this work having been received from the Colonial Development Fund.

(2) The decision to deliver plants free of charge to planters.

(3) The opening of three District Nurseries viz :—
two in Praslin and one in South Mahé.

(4) The depressed value of coconut products which has induced planters to take up alternative crops. The production of these plants is no light task owing to lack of skilled workers and the necessity of having to import most of the propagating material. The aim of the Department is to supply only plants of good quality and the technique necessary is not easily developed in labour with hardly any knowledge of plant husbandry.

52. The Central Nursery attached to the Botanical Gardens, Victoria, was first started in 1932 and has since been steadily extended.

53. *South Mahé.* Great difficulty was experienced in finding a convenient site owing to all flat land possessing soil suitable for Nursery work being occupied by coconut trees. Eventually it was decided to start a Nursery on a small area forming part of the Sancta Maria Estate principally for raising *Eucalyptus citriodora* and as a centre of distribution for plants raised at Victoria. It has served its purpose in this respect but does not lend itself to any large scale work or the establishment of small demonstration plots. The Department is on the lookout for a more suitable place.

54. *Praslin.* Here again great difficulty was experienced in securing suitable land.

55. *Fond Boffay.* A small site was chosen on a private Estate possessing the advantages of being centrally situated and adjacent to a main route. This land which was more or less abandoned was put into condition and seed sheds erected. As the area was limited another small Nursery (No. 4), has been started on the Nouvelle Découverte Estate at Grand'Anse.

56. Since receipt of the grant orders have been despatched to Ceylon for 10,000 seeds of the Hamban Puwak variety of Areca nut and 1,000 seeds of the large variety of Nutmeg. Excelsa coffee has been imported from Uganda, and various varieties of budded citrus plants from South Africa. The propagation of the imported pepper varieties proceeds as cuttings become available and all seeds of Cardamoms and Allspice are carefully collected for propagation.

57. The propagation of citrus has not been satisfactory owing to the prevalence of canker and the prevailing wet conditions of the year. Then again the only bud wood available has had to be obtained from the few trees imported in January and June 1933. However every effort will be made to overcome these setbacks as it is felt that there is a future for citrus cultivation here if only on a small scale, apart from the necessity of removing the anomaly of a tropical country practically devoid of marketable citrus fruits. Lack of material for propagation and the difficulties attendant to obtaining same from abroad has proved and is proving the Department's greatest handicap.

58. The thanks of the Department are due to the following owners who have kindly lent land free of charge for the establishment of Nurseries:— Dr J. T. Bradley, O.B.E., South Mahé, Messrs G. Loizeau and F. A. Jumeau, Praslin.

59. *Total distribution from Economic Nurseries.*

Names.	1934.	1933.
<i>Eucalyptus citriodora</i>	41,797	15,120
„ <i>staigeriana</i>	9	...
„ <i>rostrata</i>	287	...
Robusta coffee	8,917	5,351
Excelsa coffee	340	...
Areca nut palms	1,009	341
Allspice seedlings	136	78
Pepper cuttings (imported)	253	50
Budded citrus	£9	...
Palmarosa clumps	5,387	550
Lemongrass „	2,340	...
Nutmegs	364	36
Onion seedlings	1,555	1,225
Coconut seedlings	55	...
Cocos de mer	242	...
Cardamoms	120	...
Cocoa seedlings	64	225
Cloves	43	10
Gliricidia cuttings	160	...
Mangoes	4	...
Miscellaneous economic plants	705	490
Total.	63,826	23,476
Various seeds	510 packets.	

(d). *Laboratory and distillation investigations.*

60. The Laboratory Assistant, Mr A. Morel, was in charge of the Laboratory and Distillery. During his two months' absence in Kenya the work was performed by Mr P. Sauvage.

The standardisation of the essential oils produced in this Colony by the compulsory examination, prior to export, has been the logical outcome of the efforts of the Agricultural Department in carrying out Mr Stockdale's recommendations and the guidance given by Mr Holdsworth Haines during his stay in this Colony. The practical results of such advice and direction have proved to be of great value.

61. The attention of the planting community towards the production of new essential oils has been secured by the Agricultural Department's work of firstly:— isolating the plants of Palmarosa, Lemon grass and Citronella, and secondly, determining their marketing possibilities and values and thirdly, by its Nursery activities in propagating and distributing these plants, especially *Eucalyptus citriodora*. Valuable demonstration has also been afforded and instructive results obtained in the cultivation of these plants in the experimental still brought out by the Expert Distiller.

62. The stage has now been reached where the export of these oils will shortly commence. The results already achieved with Patchouli oil which has been subjected to examination prior to export since the beginning of 1933, and the desirability of assuring a good standard and name for the new oils right from the outset has decided this Government, supported by the unanimous approval of the producers themselves, to place all the oils, with the possible exception of Cinnamon leaf oil, under the provisions of the Patchouli Oil Ordinance.

63. The kind cooperation of the Government of Kenya enabled Mr. Morel to be sent to the Scott Laboratory, Nairobi, where he received a two months' course of training in the testing of essential oils under the essential oil Chemist there. This tuition has enabled him to carry out the usual commercial tests of the essential oils of this Colony and the Department was thus able to make arrangements to carry out the testing of all oils prior to export.

64. The analytical tests include Specific gravity., Refractive index., acid value., ester value., ester value after acetylation., total alcohol., optical rotation., phenol content., citral content by both methods., estimation of aldehydes and solubility.

65. The Department likewise analyse fermented liquors sent by the Superintendent of Excise to ascertain whether it is bacca, adulterated bacca, calou, toddy or other fermentations. This work is somewhat of a hindrance and takes up a considerable amount of time especially as the Officer has to appear as a Court witness when adulterations are detected and proceedings taken. Twenty two of these samples were examined during the year. Forty two samples of Patchouli Oil were taken from the Customs and analysed. One consignment was rejected and the rest passed as "Standard Quality". Nineteen samples of Cinnamon leaf oil were sent in by merchants to ascertain the phenol content.

66. Other oils analysed were Cinnamon bark three samples and two each of Lemongrass and Palmarosa.

Distillery work.

67. One hundred and ten distillations of different essential oil plants were effected; these are summarised as follows:—

Names.	Distillations.
Patchouli	2
Palmarosa (dried grass)	2
whole plant	23
flowers	2
leaves & stems	3
leaves only	1
E. Citriodora	17
Nutmeg seeds	1
„ mace	1
Citronella grass	19
Lemongrass	12
Ocimum	8
Cinnamon bark	3
„ leaves	16
	110

68. The following is an extract from a leaflet published during the year on experiments carried out with *Eucalyptus Citriodora* :—

69. The trees from which the material for distillation was obtained, are recorded to have been planted in November 1931, and to have received their first cropping 6 months later. Since this time they have been cropped at intervals of 2 to 4 months. The trees, 34 in number, were set out on a walled bank of transported red earth in two rows 3 feet apart by 3 feet between each tree. For the first cropping the trees were pruned back to an average height of 2 feet 6 inches. In subsequent croppings it has been the practice to prune back to a few inches above the previous cutting to secure a vigorous break from buds on the younger wood. The average height at which the trees were pruned at the last cutting was 4 feet 6 inches. As the heights of pruning will progressively increase, an experiment has been started to ascertain the minimum amount of new wood which requires to be left to ensure vigorous new growth. It has been noted that this tree, when subjected to severe pruning, tends to throw all its energies into the development of two or three main shoots. This tendency to perpendicular rather than to lateral development, shows that close spacing can be practised compatible with suitable soil conditions.

70. During 1933 this plot of trees was cropped on the following dates :—

9th March 1933, 16th June 1933, 30th September 1933. The data given below is from the cropping which commenced on the 31st January. The first 40 trees, showing slightly better growth than the remainder, were cropped in batches of ten trees each, and gave the following results.

Weight of fresh leaves per 10 trees	=	16.25 kilos
" " stems " "	=	13.8 "
" leaves per tree	=	1.625 "
" stems " "	=	1.38 "
Total quantity fresh leaves from 84 trees	=	137 "
Total quantity of stems from 84 trees	=	105 "

Results of distillations were as follows :—

Distillation.	Quantity distilled.	Yield per ton.
No. 1	22 kilos	20.45 litres
2	15 "	23 "
3	14½ "	23 "
4	15 "	22 "
5	15 "	23 "
6	13½ "	23 "

N.B.—No. 5 consisted of smooth or glabrous leaves, and No. 6 of the hairy or pilose type of leaf.

A distillation of 7½ kilos of fresh leaves yielded no oil. The average time taken for each distillation was 1 hour 40 minutes, and the weight of steam used for the first distillation was 38.75 kilos.

Forty two kilos of fresh leaves were allowed to dry for 15 days, and were then weighed and distilled. The leaves when dry weighed 21 kilos. Two distillations were made yielding at the rate of 45 litres to the ton.

The weight of dry leaves required to charge the still was found to be about half that required when charging with fresh leaves.

Livestock.

71. The Freisian herd owned by the Department consisted at the end of the year of three bulls and three cows. Two heifers were auctioned and sold; one of six months realising Rs. 100, and the younger of one month being sold for Rs. 50. The older bull developed an illness as a result of its hooves splitting, possibly due

to being continually confined in a hard floored byre. The hooves responded to treatment and the animal was afterwards removed to more comfortable quarters.

72. As a measure of economy it was decided to temporarily withdraw from the Estimates the small provision allowed for the introduction of stock.

73. Révenue from sales of milk during the year amounted to Rs. 591.

(f) *Reports on Samples submitted to the Imperial Institute during the year.*

74. It is regretted that these reports cannot be submitted in full owing to lack of space and (in most cases) the analytical results have not been included. The full reports are available at the Department's Offices to those interested. The conclusions to be drawn from them as a guide to the Agricultural industries are however indicated.

O. 2372/7

Imperial Institute
London, S. W. 7
11th. July, 1934.

Report on Eucalyptus Citriodora Oil from Seychelles.

75. The samples which are the subject of this report were forwarded to the Imperial Institute by the Acting Director of Agriculture and are referred to in his letter No. E3/421/34 of the 16th. April 1934.

Description.

The samples were as follows :—

No. 1. Distilled on 22.2.1934 from leaves which had been allowed to dry under shade to 50 per cent of their original weight.

No. 2. Distilled on 31.1.1934 from fresh leaves.

No. 3. Distilled on 6.2.1934 from hairy or pilose leaves.

No. 4. Distilled on 1.2.1934 from smooth or glabrous leaves.

Each sample consisted of about 110 cc. of clear, very pale greenish-yellow oil. They all possessed the pleasant characteristic odour of *E. Citriodora* oil. No. 1 being somewhat inferior to the others in this respect. The odour of No. 3 was slightly sweeter than the rest (as stated by Mr. Holdsworth) whilst between Nos. 2 and 4 no difference could be detected.

Remarks.

76. The analysis of the samples showed that there were no very marked differences between the four oils and that they were similar in character to the previous sample from Seychelles. They all contained high percentages of the chief constituent, citronellal. Sample No. 1 contained less of this aldehyde than the three other oils, and both the Imperial Institute and the importers considered the odour of this sample to be not quite so satisfactory as that of the other three oils or of the previous sample from Seychelles. On the other hand a user of *E. Citriodora* oil selected No. 1 as the best for his purpose but stated that there was little difference between that sample and No. 4. The preference for one of the four oils over the others would thus seem to be a matter of individual judgment.

77. The odour of oil No. 3, from the pilose type of leaves, appeared to be slightly sweeter than that of No. 4 from the glabrous leaves.

78. It seems unlikely that there would be any material difference in the market values of the four oils, but should it be confirmed that the drying of the leaves before distillation (as in the preparation of No. 1) slightly affected the quality of the oil, any slight reduction in the market value may be fully compensated by the lower cost of distillation owing to the larger quantity of leaves which can be dealt with in the still at one operation.

79. A larger quantity (2 to 3 lb) of the oil distilled from the dried leaves might be prepared and forwarded for further examination and submission to likely users for their opinion as to its quality and value.

Imperial Institute,
London, S.W. 7,
7th December, 1934.

Report on Eucalyptus Citriodora oil from Seychelles.

80. The sample of oil which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. E3/1934 of the 7th September 1934. It had been distilled from the dried leaves of *EUCALYPTUS CITRIODORA*, and was sent for examination and submission to possible consumers in the United Kingdom, in accordance with a suggestion made in Imperial Institute report of the 11th July 1934 on previous samples of *E. CITRIODORA* oil.

Description.

81. The sample consisted of about 2 pints of slightly turbid oil, which after filtration was clear and of a pale greenish-yellow tint, somewhat darker than that of the samples of *E. CITRIODORA* oil previously submitted from Seychelles.

Commercial value.

82. The oil was forwarded to the essential oil importers in London who reported on the previous samples and had offered to submit the oil to likely users if a larger quantity could be supplied for the purpose. The firm after consulting consumers reported that there was a demand among their clients for the oil at the price of 1s. 6d per lb., and that they would be glad to obtain supplies as early as possible.

Remarks.

83. The results of this investigation indicate that a market can be found in the United Kingdom for Seychelles *E. CITRIODORA* oil distilled from the dried leaves if it can be offered at a suitable price.

84. At a recent meeting of the Imperial Institute Advisory Committee on Essential Oils considerable interest was shown in the samples of *E. CITRIODORA* oil from Seychelles which were considered to be of excellent quality. It was agreed that the oil from the fresh leaves has the pleasanter aroma, but it was considered that the oil from the dried leaves should prove more useful as it would be more suitable for blending. The Committee were of opinion that there should be a good future for the oil if it can be offered at about 1s. 6d per lb., as there is a demand for a cheap oil which would be able to compete with Java Citronella oil.

Imperial Institute,
London, S.W.7,
27th June 1934.

Report on Citronella oil from Seychelles.

85. The sample of Citronella oil which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. E3/304/34 dated 23rd March 1934.

Remarks.

86. The analytical result showed that the present sample closely resembled the previous Seychelles Oil "No. 5", the figures obtained agree generally with those recorded for commercial Ceylon citronella oil. The odour of the present oil was somewhat stronger than that of the previous sample.

Commercial value.

87. The oil was submitted to a firm of essential oil distillers in London, who furnishes the following observations :—

"This is very similar to Ceylon citronella oil on figures and on odour. The borneol content is probably lower than that of Ceylon citronella oil. It would have to compete with Ceylon citronella oil in price".

At the present time Ceylon citronella oil is quoted in London at 1s. 1d per lb, c.i.f.

O.2532/3

Imperial Institute,
London, S.W.7,
27th June 1934.

Report on Ocimum Viride oil from Seychelles.

88. This sample of Ocimum Viride Oil which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. E3/304/34 dated 23rd March 1934.

Commercial value.

89. The oil was submitted to a firm of essential oils distillers in London, who reported that in their opinion the odour was not quite so fragrant as that of Spanish thyme oil, and that for perfumery purposes the oil would not command such a high price as the latter. The residual odour was quite clear, in contrast to that of a sample from the Seychelles examined in 1917 which was reported to have a rather smoky residual odour. The firm considered that the present oil should be useful for the production of thymol.

90. Thyme oil is at present quoted in London as follows :—

White thyme oil (25 - 30 % phenols), 3s 6d per lb.

Red " " (50% phenols, 4s to 4s 3d per lb.

Thyme is now realising the following spot prices in London :—

Synthetic, from 5s 4d per lb (for small quantities).

" to 4s 10d per lb (for large quantities).

Natural from 7s 9d per lb (for small quantities).

to 7s. 3d per lb (for large quantities).

O.2532/3.

Imperial Institute,
London S.W.7,
27th June 1934.

Report on Ocimum Oil from Seychelles.

91. The sample of Ocimum Oil which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture and is referred to in his letter No. E3/304/34 dated 23rd March 1934.

Remarks.

92. Owing to the small quantity of oil available no attempt was made to characterise the acids and phenols present, but the foregoing results show that the chief constituents of the present sample was citral. Small amounts of another aldehyde (possibly citronnellal) and a ketone are also present, in addition to acids and phenols; the remainder of the oil apparently consisting of terpenes.

93. It may be mentioned that this oil appears to resemble closely that of *O. pilosum*, examined in 1914 by K. Bhaduri (*J. Amer. Chem. Soc.*, 1914, 36, 1772) and stated to have an odour resembling that of lemongrass oil.

Commercial Value.

94. The oil was submitted to a firm of essential oil distillers in London, who furnished the following observations:—

"This is similar to *Ocimum pilosum* oil, and has a lemongrass odour. It is a clean oil but not so fine as pure verbenia oil. We do not think it would have a very good sale in this country."

O. 2532/2.

Imperial Institute,
London S. W. 7.
18th September 1934.

Report on Ocimum oil from Seychelles.

95. The sample of *Ocimum* Oil which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. E3/595/31 of the 21st June 1934.

Description.

96. The sample was labelled "*Ocimum* Oil No. 3". Yield 6.55 litres per ton. Distilled 30. 5. 34. It consisted of 4 oz. of oil, which on receipt was turbid owing to the presence of moisture, but after filtration through paper was clear and of orange-brown colour. The oil had a fairly pleasant odour, somewhat similar to that of spike lavender oil.

Commercial Value.

97. The oil was submitted to a firm of essential oil distillers in London who furnished the following observations:—

"We have examined the sample of *Ocimum* Oil No. 3 and our laboratory reports as follows:—

The odour of this oil is somewhat similar to that of spike lavender but not so pronounced in cinole. It would blend nicely with French lavender oil in compounding soap perfumes. The odour is rather too crude for it to be used in fine quality perfumes."

98. It is possible that oil of the quality of the present sample would be marketable as a substitute for spike lavender oil, the Spanish variety of which is currently quoted at 5s. 9d. in London, landed terms.

Remarks.

99. If the yield of "6.55 litres per ton" (stated on the label attached to the sample), which is equivalent to about 0.6 per cent, is obtained by the distillation of the whole plant, it compares very favourably with that of spike lavender (recorded as ranging from 0.5 to 1.0 per cent) which is distilled from the inflorescence only, since the quality of the *Ocimum* plant obtainable would obviously be much greater than that of the spike lavender flowers from an equal area of cultivated plants.

O. 2532/4

Imperial Institute,
London S. W. 7.
12th July 1934.

Report on Ocimum oil from Seychelles.

100. The sample of oil which is the subject of this report was forwarded to the Imperial Institute by the Acting Director of Agriculture, and is referred to in his letter No. E3/417/34 of the 26th April 1934.

Remarks.

101. The oil had a rather pleasant odour resembling that of samples of *O. gratissimum* oil received from Seychelles in 1917 and 1918, and its constituents

are probably the same. These earlier samples contained 62 and 55 per cent of eugenol respectively, and further detailed examination showed that the remainder consisted mainly of linalool, the terpene ocimene, and small proportions of linalyl acetate and methyl-chavicol.

102. The present oil contains too little eugenol to be of value as a commercial source of this constituent, and it is doubtful whether it would find a ready market in the United Kingdom, but in order to form a definite opinion on this point it might be worth while to forward a further quantity for submission to the trade. It may be recalled that a firm of essential oil distillers who were consulted concerning the value of the Seychelles *O. gratissimum* oil examined in 1917 did not consider it to have a sufficiently pleasant odour to be of use in perfumery and could not suggest any other purpose for which it might be employed.

103. It would be of interest to learn the botanical origin of the present oil, and the Imperial Institute will be glad to receive herbarium specimens of the plant for identification.

O, 2532/3

Imperial Institute,
London S. W. 7.
27th June 1934.

Report on Ocimum Oil from Seychelles.

104. The sample of Ocimum oil which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. E3/304/34 dated 23rd March 1934.

Commercial value.

105. The oil was submitted to a firm of essential oil distillers in London, who furnished the following observations:—

The odour is very fresh but very delicate and the oil should be useful for cosmetics, such as tooth pastes, high class soaps and perfumes for shampoos etc.

Remarks.

The odour of the oil is attractive, though not so fine as that of sweet basil oil, to which it shows some resemblance. There would be probably a market for the oil, but to determine its value it would be necessary for a larger sample (say about 1 lb) to be forwarded for further chemical examination, and for submission to the trade. It is also desirable that the identity of the plants from which the oil is prepared should be stated, or if this is not known, herbarium specimens should be sent to the Imperial Institute for identification at Kew.

O. 2532/5.

Imperial Institute,
London S. W. 7,
18th September 1935.

Report on Ocimum Oil from Seychelles.

107. The sample of Ocimum oil which is the subject of this report was forwarded to the Imperial Institute by the Director of Agriculture, and is referred to in his letter No. E3/395/34 of the 21st June 1934.

Description.

108. The oil was labelled "Ocimum oil No 6, Yield 3.5 litres per ton, distilled 21.6. 1934", and was stated to be obtained from a plant known locally as "Toc Maria". It consisted of 1½ oz. of a clear, very pale yellow oil, with an odour somewhat resembling that of sweet basil oil but not so fine, and rather less pleasant than that of the sample of "Toc Maria" oil dealt with in Imperial Institute report of the 27th June 1934.

Remarks.

109. The examination showed that the constants of the present oil resembled those of the earlier samples from Seychelles. Compared with commercial sweet basil oils its constants more resemble those of the Reunion oil than those of the French, German, Algerian and Spanish kinds.

110. As stated in Imperial Institute report of the 27th June 1934 on the earlier sample of the "Toc Maria" oil received from Seychelles, the product would probably be saleable in the United Kingdom, but in order to determine its actual value a sample of about 1 lb would be required for submission to the trade.

Botanical specimens sent to Imperial Institute.

111. It appears most important to record the following report on botanical specimens of economic plants under experiment in Seychelles which were forwarded to the Imperial Institute with the following letter:—

E3/1934.

Department of Agriculture,
Seychelles, 9th October 1934.

112. Sir,

With reference to my letter No. E3/852/34 of the 7th September, I am forwarding by this mail duplicate specimens of the various Citronellas, Lemongrass, Palmarosa and Ocimums, the oils of which have been forwarded (with one or two exceptions) to you for examination and report during the past year.

2. The attached list gives the number of dried specimen in the first column in the second column the numbers refer to the number under which the oil samples were sent for examination, and the last column gives the oil report reference.

3. Identification of these specimens, coupled with the report of their oils, should prevent future confusion and prove of general interest.

4. It is hoped that the specimens of ginger grass and palmarosa which have been taken from authentic material as far as the essential oils are concerned, will on close study reveal botanical differences to facilitate their identification in the field.

Yours faithfully,

F. L. SQUIBBS,
Director.

The Director Imperial Institute,
London S. W. 7.

113.

Specimen No.	Distillation No.	Names.	Oil report reference.
1	4	Ocimum (gratissimum)	O. 2532/4 of 12.7.1934.
2	1	Ocimum viride	O. 2532/3 of 27.6.1934.
3	5	Ocimum	Oil not sent.
4	6	Ocimum ("Toc Maria")	O. 2532/3 of 27.6.1934.
5	1	Citronella or Lemon grass	O. 2532/2 of 25.10.1933.
6	2	Lemon grass poor quality	" "
7	3	Citronella or Lemon grass	" "
8	5	Ceylon Citronella	O. 2372/6 of 30.1.1934.
9	6	Lemon grass	" "
10	7	Java Citronella	Oil not sent.
11	8	Ceylon Citronella	O. 2532/3 of 27.6.1934.
12	11	Citronella	Oil not sent,
13	...	Cymbopogon martinii Motia var. "Palmarosa"	O. 2372/4 of 30.1.1934.
14	...	Cymbopogon martinii Sofia var. "Gingergrass"	See report sent 1931.
15	2	Ocimum sp.	O. 2532/3 of 30.4.1934.
16	3	Ocimum sp.	Oil sent on 21.6.1934.

No. O.2372/9.

Imperial Institute,
London S. W. 7,
4th December 1934.

114. Sir,

I have to acknowledge the receipt of your letter E3/1934 of the 9th October, with enclosure, together with the duplicate specimens of essential oil plants referred to therein.

The specimens have been duly submitted to the Director of the Royal Botanic Gardens, Kew, and I send herewith a statement giving (a) the specimen numbers, distillation numbers and names given in your list, (b) the identity of the plants as determined at Kew, and (c) remarks on the oils in relation to the identifications.

3. It will be observed that in the case of specimen No. 16 it was not found possible to determine the species, and you may perhaps be able to furnish complete material for further examination.

I am, Sir,
Your obedient Servant.

HAROLD BROWN,
Principal, Plant & Animal
Products Department.

The Director of
Agriculture, Seychelles.

115.

Specimen No.	Distillation No.	Names	Kew identification.
1	4	<i>Ocimum (gratissimum)</i>	<i>Ocimum sanctum</i> Linn.

The oil of *O. sanctum* has been reported by Bacon (Phillippine Journal of Science, 1910, 5, 261) to resemble that of *O. basilicum* and to contain 50 to 60 per cent of estragol (methylchavicol), and there is no record of the presence of eugenol in the oil. Hence if Bacon's observations are correct, *O. sanctum* oil differs widely from the oil stated to have been distilled from the Seychelles plant represented by specimen No. 1, which possessed an odour similar to that of *O. gratissimum* oil and contained 33 per cent of phenols (consisting almost entirely of eugenol) see Imperial Institute report dated 12th July 1934).

2	1	<i>Ocimum viride</i>	<i>Ocimum viride</i> Willd.
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The principal constituent of this oil was thymol.

3	5	<i>Ocimum</i>	<i>Ocimum americanum</i> Mill.
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(Oil not sent to the Imperial Institute). According to the *Kew Bulletin* (Additional Series IX, page 528, *O. americanum* Mill. = *O. canum* Sims. The oil of this plant is reported to contain camphor but in certain samples obtained from plants grown in West Africa the presence of methyl cinnamate has been recorded.

4	6	<i>Ocimum</i> ("Toc Maria")	<i>Ocimum basilicum</i> L. ?
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This oil resembled ordinary sweet basil oil and contained estragol (methylchavicol) as its principal constituent.

5	1	Citronella or Lemongrass	<i>Cymbopogon flexuosus</i>
---	---	--------------------------	-----------------------------

(Nees) W. Watson ? or
possibly a hybrid between
C. flexuosus and *C. Nardus*.

This oil was of inferior quality and not representative of either normal lemon-oil or normal citronella oil.

- | | | | |
|---|---|-------------------------|--|
| 6 | 2 | Lemongrass poor quality | <i>Cymbopogon flexuosus</i>
(Nees) W. Watson. |
|---|---|-------------------------|--|

The oil would be classed as a lemongrass oil of low grade.

- | | | | |
|---|---|--------------------------|---|
| 7 | 3 | Citronella or Lemongrass | <i>Cymbopogon confertiflorus</i>
(Steud.) Stapf. |
|---|---|--------------------------|---|

This oil was of inferior quality and not representative of either normal lemongrass oil or normal citronella oil. *C. confertiflorus* is one of the wild "mana" grasses of Ceylon. Samples of the Ceylon oil examined at the Imperial Institute some years ago were found to be inferior to Ceylon citronella oil and of little commercial interest (see Bulletin of the Imperial Institute, 1911, 9, 242).

- | | | | |
|---|---|-------------------|---|
| 8 | 5 | Ceylon citronella | <i>Cymbopogon Nardus</i> .
(L.) Rendle |
|---|---|-------------------|---|

The oil had the odour of citronella but rather weaker than good Ceylon oil.

- | | | | |
|---|---|------------|--|
| 9 | 6 | Lemongrass | <i>Cymbopogon citratus</i> (DC.)
Stapf (no inflorescence) |
|---|---|------------|--|

A lemongrass oil of satisfactory odour.

- | | | | |
|----|---|-----------------|--|
| 10 | 7 | Java citronella | <i>Cymbopogon Nardus</i> (L.)
Rendle (no inflorescence) |
|----|---|-----------------|--|

(Oil not sent to the Imperial Institute).

- | | | | |
|----|---|-------------------|---|
| 11 | 8 | Ceylon citronella | <i>Cymbopogon Nardus</i> (L.)
Rendle |
|----|---|-------------------|---|

Oil similar to commercial Ceylon citronella.

- | | | | |
|----|----|------------|---|
| 12 | 11 | Citronella | <i>Cymbopogon</i> sp. possibly a
variety of <i>C. Nardus</i> |
|----|----|------------|---|

(Oil not sent to Imperial Institute).

- | | | | |
|----|-----|--|---|
| 13 | ... | <i>Cymbopogon Martinii</i> Motia
var. "Palmarosa" | <i>Cymbopogon Martinii</i>
(Roxb.) W. Watson † |
|----|-----|--|---|

Oil of Palmarosa type.

- | | | | |
|----|-----|--|---|
| 14 | ... | <i>Cymbopogon Martinii</i> Sofia
var. "Gingergrass" | <i>Cymbopogon Martinii</i>
(Roxb.) W. Watson † |
|----|-----|--|---|

The odour and characteristics of the oil suggested a mixture of gingergrass and palmarosa grass.

- | | | | |
|----|---|-------------------|---------------------------------------|
| 15 | 2 | <i>Ocimum</i> sp. | <i>Ocimum americanum</i> Mill. forma. |
|----|---|-------------------|---------------------------------------|

The oil had a lemon-grass odour and constants resembling those of *O. pilosum* oil and its composition differed entirely from that recorded from *O. canum* oil (see remarks on specimen No. 3).

- | | | | |
|----|---|-------------------|-------------------|
| 16 | 3 | <i>Ocimum</i> sp. | <i>Ocimum</i> sp. |
|----|---|-------------------|-------------------|

The oil somewhat resembled spike lavender oil, especially in odour.

† It is impossible to distinguish between the vars. Sofia and Motia by the examination of herbarium specimens.

Report on Chillies from Seychelles.

116.

Imperial Institute,
London S. W. 7,
30th October 1934.

1767.

The two samples of chillies which are the subject of this report were forwarded to the Imperial Institute by the Director of Agriculture, and are referred to in his letter No E3/1934 of the 18th August 1934. It was desired to ascertain their quality and value, and whether consignments of similar character would be marketable.

Description. The samples weighed 4 oz. each and were as follows:— No 1. Small chillies of mixed appearance and variable size, ranging from three eighths to three-fourths inch in length. The colour was poor and uneven, being bright red, orange and brown. The sample was free from stalk, but the chillies were rather shrivelled and there were signs of slight insect attack. No 2. Chillies of dull,

variable brown colour and uneven size, the lengths being similar to those of sample No 1. Some of the chillies were greenish or reddish. The sample had been slightly attacked by insects.

Both samples contained many small, poorly developed pods, and were generally of inferior appearance.

Commercial value. The chillies were submitted to a firm of merchants in London, who furnished the following observations :—

“With regard to No 1, this represents a very low grade lacking in colour and in a wormy condition. This quality has proved difficult to sell, and the few samples during the past year has been negotiated at 12/6 to 17/6 per cwt., duty paid, less 2½% ex wharf London.

With reference to No 2, owing to the dark colour and condition they are not marketable in London. For your guidance a parcel of a better colour was offered at 3/6 per cwt., usual terms and conditions”.

Two firms of brokers were also consulted regarding the value of the samples and reported as follows :—

“(a) *No 1.* Fair quality, good size, red but mixed with yellow pods wormy, value 25 to 30 shillings per cwt., spot.

(b) *No 2.* Very poor quality. Brown colour wormy.

Not easily saleable, value 10 to 12/6 per cwt., spot.

(a) *No 1.* Small red mixed, perished, to-day's value about 25/- per cwt ex wharf London.

(b) *No 2.* of no commercial value.”

At the time of the above valuations, the following prices were quoted in the London markets :—

Japanese chillies	80/- per cwt.
Zanzibar and Mombasa chillies	52/6 to 55/- per cwt.
West African chillies	45/- to 59/- per cwt.

Remarks. The chillies represented by Sample No. 1 could possibly be marketed in London, but sales might be difficult and the price realised would be low. Sample No. 2 would not be worth shipment to United Kingdom. It would seem desirable therefore that before forwarding consignments to this country endeavours should be made in Seychelles to improve the quality of the chillies produced so that they would be able to compete on better terms with supplies received in London from other sources.

There is a steady demand in the United Kingdom for the better kinds of chillies, but it is stated that market does not admit of much expansion and that any large increase of production might bring about a considerable fall in price. Moreover in order to realise the best prices, great care must be exercised in the preparation of the fruits. Drying should be so effected as to produce a uniform bright red colour, whilst consignments must be free from stalk, as unbroken as possible and not damaged by mould or insects.

O. 2586.

Imperial Institute,
London S. W. 7.
7th September 1934.

117.

Report on Dried Coconut kernels from Seychelles.

The samples of dried coconut kernels which is the subject of this report was forwarded to the Imperial Institute by the Acting Director of Agriculture, and is referred to in his letter No. E3/578/34 of the 18th June 1934.

The sample consisted of whole coconut kernels, which were stated to have been dried in the shell. It was desired to ascertain whether the quality of the copra had been affected by the absorption of water, and whether a commercial outlet could be found for the dried kernels either in the confectionery trade or as novelties.

Description.

The sample consisted of 12 coconut kernels, of which two entire and uncracked specimens were selected for detailed examination. On opening these kernels they were found to be free from milk, and to have a greyish-white translucent flesh with a pleasant sweet taste.

Results of Examination.

The kernels were examined with the following results :—

Moisture per cent	7.5
Oil in kernels as received per cent	65.1
Oil expressed on moisture free kernels per cent	70.4
Acid value of extracted oil	0.3
Free fatty acids in extracted oil (expressed as lauric acid), per cent	0.11

The oil, as extracted from the kernels with light petroleum, was of good colour.

The foregoing results show that the kernels contained a normal percentage of oil and that the acidity of the extracted oil was very low. It is thus seen that the drying of the kernels with absorption of the milk had not adversely affected their quality as copra, but the moisture content of 7.5 per cent was considerably higher than is usual in commercial copra of good quality, which generally contains only about 4 per cent.

Commercial Value.

The following enquiries were made in order to ascertain whether these dried coconut kernels would be likely to find any outlet in the United Kingdom. From the replies received it will be seen that there is little prospect of a market for the material except as a source of oil, for which purpose however it is unlikely to be able to compete with ordinary copra.

(1) Two firms of importers of fruit and coconut products in London were consulted. The first firm stated that similar samples of dried kernels had been previously received on the market, but had aroused no interest. There would be no outlet for them, either in the nut trade or as novelties. The second firm expressed the same opinion, and added that whole coconut kernels are of no value in the United Kingdom except as a source of oil, the confectionery trade could not use them.

(2) A sample of the kernels was sent to the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery, and Jam trades, and the following reply was received :—

"I have shown one of the samples to a prominent manufacturer of confectionery. He stated that, in his opinion, there would be no appreciable trade, the reason being that to use them special plant would have to be installed. Further, prepared coconut as used in the confectionery trade is very cheap at the present moment".

(3) A large firm of chocolate manufacturers who were consulted replied as follows :—

"A point of interest is the fresh appearance and sweet condition of the white meat, which would otherwise be so much discoloured by the usual process of preparation of copra.

"The use of coconut in our own confectionery is confined to the prepared, desiccated article. Therefore we are unable to suggest a price for the whole kernels, or to estimate the possible scope for such a product amongst those firms who may be equipped with the necessary apparatus for desiccating in this country".

(4) A sample was also sent to a large firm of confectionery manufacturers, who reported as follows :—

"The confectionery trade undoubtedly uses a large quantity of coconut, but the lines into which it goes are manufactured rather for mass consumption than for

specially educated palates. At present the ordinary dessicated coconut, obtained in the main from Ceylon is exceptionally cheap, and can be bought to-day at the price of 14/6d per cwt. With this the trade is completely satisfied, particularly as the article is immediately ready for use. It is already ground up and free from the brown skin.

There was a time when we ourselves preferred to use fresh nuts, as in our opinion the resulting article was better flavoured. The colour, however, was not so good and it is our clear conviction that under the present circumstances the public will not pay more than the lowest possible figure for the goods".

-F. 2022.

Imperial Institute,
London S.W.7,
30th November 1934.

Report on coir from Seychelles.

118. The three samples of coir which are the subject of this report were forwarded to the Imperial Institute by the Director of Agriculture and are referred to in his letter No. E3/1934 of the 7th September 1934.

The coir had been produced by a local manufacturer of ropes, etc., and it was desired to ascertain the quality and market value of the samples.

Description.

No 1. "Best quality which approximates to bristle fibre". Weight 2 lb.

This sample consisted of seven bundles of fibre composed of a mixture of fine and somewhat coarse fibre of cinnamon brown colour. The material had been well prepared and was free from pithy matter. The length of the fibre varied from about 8 to 12 inches, being mostly between 8 and 11 inches. The fibre possessed good elasticity and strength.

No 2. "Yarn used for rope making". Weight 1 lb. 3oz.

This sample consisted of a tangled bundle of fine and coarse coir fibre, the fine fibre predominating. It was of similar colour to Sample No. 1, but had not been so well cleaned and some of the fibres had not been freed from adherent pithy matter. The length of the fibre was irregular and varied from 3 to 11 inches, being mostly from 5 to 7 inches. The strength and elasticity of the fibre were good.

No 3. "Grade of mattress fibre". Weight 1 lb. 7 oz.

This sample consisted of a tangled mass of generally fine, imperfectly cleaned, rather dusty fibre, of similar colour to the above samples. It had not been completely freed from pithy matter, and some small pieces of unseparated husk together with some short broken fibre were present. The fibre was very irregular in length, varying from 2 to 10 inches, being mostly between 3 and 7 inches. The strength and elasticity were on the whole somewhat inferior to those of the other samples.

Commercial value.

The samples were submitted to two firms of importers in London, whose observations are quoted below as (a) and (b) in the case of each sample.

Sample No 1. (a) The first firm reported that the sample was well cleaned and of good colour; the fibre was rather soft, but this was not considered a serious defect. The fibre was of good quality but could not be marketed in its present condition. Further grading would be necessary, for although most of the fibre was of the required length for bristle fibre viz. 9 in. and over, the proportion of short and irregular fibre present was far too large. It was suggested that the fibre could be separated into two or possibly three grades of bristle fibre, and the fact was stressed that bristle fibre *must* be efficiently graded for length.

(b) The second firm regarded the sample as well clean and hackled, but considered the colour to be a little dingy. The material was of rather irregular length but contained some very long fibre. Fibre in the condition of this sample would not be readily marketable and further grading would be necessary before exporting.

Sample No. 2.

(a) The first firm reported that there is no grade of coir on the market comparable with this sample. The cleanliness and quality of the material were considered good, and it was stated that further grading (for bristle fibre) would be of advantage, the longest fibres being classed as bristle fibre and the remainder as mattress fibre.

Sample No. 3.

(a) The first firm stated that this fibre, although containing a considerable amount of short fibre, was of very good quality and cleaner than is usual for fibre of this grade. They considered that it would be marketable at the highest price now ruling for mattress fibre, viz. about £6. 10s per ton.

(b) The sample was also considered by the second firm of importers to be of good quality and well cleaned. Fibre of this type, it was stated, would at present command a c.i.f. price of about £6 per ton in the United Kingdom.

General.

The firm of importers (a) suggested that regraded samples of Nos. 1 and 2 should be forwarded for further examination, so that a definite indication of their uses and value might be obtained. They stated that they would be interested to have information as to the present production of the various grades of fibre in Seychelles, and the possibility of forwarding regular shipments.

The firm pointed out that the producer would make his own profit on well graded bristle fibre, the remaining grades being sold at the lower prices paid for mattress and other so called "waste" fibres.

Remarks.

The results of this investigation show that on the whole the coir is of good quality, but that it has not been graded in accordance with the requirements of the United Kingdom market. It would be desirable to sort the fibre into two classes, viz. bristle fibre and mattress fibre, the former being regraded according to length as suggested by the importers. If further samples thus prepared were forwarded to the Imperial Institute they could be submitted to the trade for report and valuation.

It would also be of interest if information could be furnished, as requested by the importers, regarding the quantities of the different grades of fibre which could be produced and the possibility of making shipments.

119. Areca nuts.

A sample of dried Areca nuts of the strain introduced by Mr. Dupont many years ago from Ceylon was sent to Peradeniya for report. That Department replied as follows:—

No. A
Department of Agriculture,
Peradeniya, 25th April, 1934.

Areca nuts.

Sir,

In continuation of my No. A of 9th. January 1934, *re* above subject, I have the honour to inform you that the sample of dried Areca nuts sent by you for report compares favourably with the Ceylon product in quality though somewhat on the small side as regards size.

The nuts in husk as well as the dried product are readily procurable locally; the former fetching at the present time about 25 cents per 100 and the latter Rs. 13 to Rs. 14 per cwt.

A copy of leaflet No. 55 on Areca nuts is attached.

I am, Sir,
Your obedient servant.
(S) SAMUEL F. DIAS,
for Director of Agriculture.

The Director of Agriculture
Seychelles.

120.

Imperial Mycological Institute,
Ferry Lane, Kew,
Surrey,
29th June, 1934.

Reg. No. 902/34.

Sir,

The following report on the 24 specimens of scale insects sent to determine the extent of their destruction by the fungus *Cephalosporium lecanii* with your letters of 8th, 12th, 14th and 21st May last, Ref. No. F4/481/34 is based on the detailed examination of all the material by Mr S. F. Ashby, Mycologist of the Institute.

Specimen

- No. 1. *Ischnaspis* on coconut. No fungus.
 2. Lecaniid on clove leaves. *C. Lecanii* on majority of the scales.
 3. Lecaniid on silk-cotton leaves. *C. Lecanii* on most of large and many small scales.
 4. Scales on stems and leaves of *Anona Cherimolia*. A large rounded lecaniid scale (? *Saissetta hemisphaerica*) on the stem was very completely parasitized by *C. Lecanii*.
 5. Diaspid scale on *Beaumontia* leaves. No fungus.
 6. Green scale, apparently *Coccus viridis*, on lime (*Citrus aurantifolia*) leaves. Great majority of scales of all ages killed by *C. Lecanii*.
 7. Diaspid scale (apparently *Pinnaspis*) on *Dracaena* leaves.
 10. (a) *Ischnaspis* scale on coconut leaves. No fungus.
 (b) *Coccus viridis* and *Ischnaspis* on Robusta Coffee leaves. Most of the *C. viridis* showed *C. Lecanii*. A small proportion of the *Ischnaspis* also showed *C. Lecanii*.
 11. *Pinnaspis* on coconut leaves. No fungus.
 13. (a) *Ischnaspis* on *Anona cherimolia* leaves. No fungus.
 (b) ditto on coconut leaves. No fungus.
 14. (a) ditto
 (b) Lecaniid scale (*C. viridis*) on *Calophyllum* leaves. Most scales showed *C. Lecanii*.
 15. *Ischnaspis* and a Lecaniid scale on coconut leaves. The few Lecaniids had *C. Lecanii* and the moderate infestation with *Ischnaspis* showed *C. lecanii* on a few only of the scales.
 16, 17. *Ischnaspis* on coconut leaves. No fungus.
 18, 19. *Coccus viridis* on Liberian coffee leaves. Fully parasitized by *C. lecanii*.
 20. *Ischnaspis* on coconut leaves. Moderately attacked by *Pseudomicrocera henningsii* and to a lesser degree by an immature *Myriangium* which Mr Petch (to whom it was referred) thinks is probably *M. duraei*.
 21. *Ischnaspis* on coconut leaves. Scattered infection by *P. henningsii*. Some scales had a white sterile fungus unlike *C. lecanii*.
 21. (of letter dated 21.5.34)
 (a) Lecaniid scale on mango leaves. A minority bore *C. lecanii*.
 (b) *Ischnaspis* on coconut leaves. Scattered infection by *P. henningsii*.
 22. *Ischnaspis* and a lecaniid on coconut leaves. *C. Lecanii* on the Lecaniid but not detected on the *Ischnaspis* though the latter had so much saprophytic mould growth that the *C. lecanii* might have been masked.
 23. *Ischnaspis* with very few Lecaniids on coconut leaves. No fungus.
 24. *Ischnaspis* with very few Lecaniids on coconut leaves from a young tree. A minority of the *Ischnaspis* bore immature *Myriangium*.

Where "no fungus" is entered this means that no entomogenous fungus was definitely detected.

The fringe fungus, *C. lecanii* was definitely identified on two specimens, Nos. 10 and 15, of *Ischnaspis* on coconut leaves, on which lecaniid scales were also present, suggesting that it had gone over to the former from the latter. It is also noteworthy that *Myriangium* (probably *duriaei*) was present in two instances on *Ischnaspis*, Nos. 20 and 24. This is the black fungus which is one of the most efficient controls of Diaspid scales in some of the West Indian Islands, especially in Dominica. *P. henningsii* was present though not abundantly

on *Ischnaspis* in both the specimens numbered 21 as well as in 20. We already know from previous material from the Seychelles that it can heavily parasitize that scale.

In some of the specimens from the Botanic Gardens or near them the *C. lecanii* was like the Mysore strain sent from this Institute in spore length. In others (e. g. No. 4) it was more in agreement with the Ceylon strain.

Included with the specimens of scale insects in the parcel forwarded with your letter No. E4/450/34 of the 8th May, were two other specimens. These were:—

No 8 Leaves of Turmeric from the Botanic Station Gardens. Affected by the fungus *Taphrina maculans* Butler described by me in India many years ago. It causes a rather destructive leaf spot.

No 9 Palm leaf from Botanic Gardens. The leaf spots are caused by *Exosporium Palmivorum* Saac. a common leaf-spotting fungus on various palms in India and elsewhere.

As the attack of *C. lecanii* on *Ischnaspis* was slight and on two specimens only, I have not thought it worth the expense of cabling you as suggested in your letter No. E4/481/34 of 21st. May. To be of value a high percentage of the scales must be destroyed and *C. lecanii* has so far not done this on *Ischnaspis*.

I have etc,
(sd) E. J. BUTLER.
Director.

121.

Imperial Mycological Institute,
Ferry Lane,
Kew,
Surrey,
England.
3rd. December, 1934.

Ref. 1733/34

Dear Sir,

The further specimens of scales from the trees that supplied Nos. 20 and 21, sent with your letter of 7th September last have been examined by Mr. Ashby of this Institute with the following result:—

No 20. The leaf was rather heavily infested by the long scale accompanied by a second (golden) diaspid scale. The *Ischnaspis* scale showed a little *Pseudomicrocera henningsii* but *Myriangium* was not detected. On the upper side of the leaf are numerous round black shining discs of a fungus which was not entomogenous. It has been received on specimens from Seychelles on two earlier occasions (Director of Agriculture's letters of 17.10.27 and 27.5.30), without being identified. Mr. Mason has examined the present specimens and refers the fungus to the genus *Trabutia*, one of the *Phyllachoraceae*, as apparently an undescribed species.

No 21. The leaf was moderately infested by the long scale which was rather abundantly parasitised by *P. henningsii* on portions of the leaf. A little sterile *Myriangium* was present also. No other recognisable entomogenous fungus was found.

Yours faithfully.
(S) E. N. BUTLER.
Director.

The Director of Agriculture,
Seychelles.

122.

Department of Agriculture,
Seychelles, 24th. March 1934.

Sir,

I have forwarded to you by this mail a jar containing a section of the heart leaves or bud of a coconut palm found in a dying condition on the Barbara Estate, Mahe. The specimens have been packed in cotton wool and soaked in a 4% solution of formalin.

2. The Palm which seemed to be about 35 years of age was one of a group of 20 palms which showed signs of being in a distressed condition. In only two or three cases had collapse of the crown leaves occurred, and from one of those trees the specimens forwarded were removed below a putrifying mass of tissue discovered in the heart of the palm. The other trees were noticed to be affected by broken heart and other leaves but it was significant to note that in nearly every case the stems on being cut revealed either a dead or dying condition, that is, discoloured and obviously rotting. This was noticed in cases where the heart leaves appeared in sound condition.

3. Three groups of these palms were seen the same afternoon in this locality, the groups being separated by a distance of $\frac{1}{2}$ mile and 2 miles. The other groups contained 9 and 10 palms respectively. The centre palm of one of the groups showed unmistakable signs of lightning damage and the general idea given by all the palms coincide with the anticipated effect of lightning injury received during a severe thunderstorm experienced about six weeks previously. I advised the Manager to cut down and burn the palms with the collapsed tops but to await development with regards to the palms showing slight signs of injury although the condition of the stems gave me small hope for their recovery.

4. I am enclosing a leaflet embodying correspondence on the "Bud rot" question in 1924 which was apparently laid before the Board of Agriculture in August of that year. I do this as the leaflet states that bud-rot (presumably) caused by *Phytophthora* must be regarded as sporadic and secondary. It may be sporadic, but if the specimen sent is bud-rot caused by *Phytophthora* is it to be assumed as secondary to lightning injury or to the other causes mentioned by Mr Dupont in his "observations".

5. I shall be very pleased to receive a report on the specimens in due course.

6. May I also enquire if the department's letter No. E4/1015/33 of the 6th December has been received?

I have the honour to be,

Sir,

Your obedient servant.

(S) F. L. Squibbs,
Ag. Director of Agriculture.

Dr F. J. Butler C. I. E., D. Sc., F. R. S.
Director Imperial Bureau of Mycology,
Ferry Lane, Kew, Surrey,
ENGLAND.

123.

Imperial Mycological Institute
Ferry Lane, Kew, Surrey,
England.
23rd May, 1934.

Ref. 711/34.

Sir,

In reply to your letter of 24th March last forwarding specimens of the heart leaves or bud of a coconut palm found in a dying condition on the Barbaron Estate, Mahé, these specimens have now been examined and no evidence of the presence of a *Phytophthora* detected.

The fungi present in the tissues appear to be saprophytic and to have entered after the palm had been injured from some other cause. The dark discoloration of a leaf stalk and of the lower portions of some leaflets were due to the presence of sterile brown hyphæ in the tissues.

The suggestion made in your letter that the death of the bud resulted from lightning-strike seems likely to be correct (see Rev. Appl. Mycol., x, p. 16); xii, p. 506).

I cannot endorse the view that true bud rot caused by *Phytophthora* is likely to be secondary to any other cause of injury. So far as I know infection by this disease is always primary and can occur on the strongest palms.

I am,

Sir,

Your obedient servant.

The Director of Agriculture,
Seychelles.

(S) E. N. Butler.

Director.

124.

Department of Agriculture.
Seychelles, 26th April 1934.

No. E4/420/34

Sir,

I am forwarding by this mail roots specimens of two trees of *Eucalyptus Citriodora* which have died suddenly.

The foliage of both trees wilted and collapsed within two days and on examination the roots were found in a diseased condition. The roots of the smaller tree have been preserved in 4% Formalin solution and in this case the diseased condition seems to have commenced with the finer roots.

I shall be very pleased to know the cause of the trouble and to be informed of any remedial measures which might be taken.

I have the honour to be,

Sir,

Your obedient servant.

(S) F.L. Squibbs.

DIRECTOR.

The Director,
Bureau of Mycology
Ferry Lane, Kew, Surrey.

125.

Imperial Mycological Institute

Ferry Lane, Kew, Surrey

30th. June, 1934.

Ref. 903/34.

Sir,

I beg to report that the specimens of dead roots of two *Eucalyptus* trees sent with your letter No. E4/420/34 of 26th. April last have been examined by Mr. Ashby, who could find no evidence of the presence of a parasitic fungus on the roots of the smaller tree, while those of the larger one were in an advanced stage of decay. In the latter the bark had rotted away and the wood of the largest piece showed black lines of a kind known to be caused by a number of fungi. Of these the most likely to produce them under the circumstances are *Armillaria Mellea*, *Ustulina zonata*, and *Xylaria* spp., all of which occur in the East African colonies. Another piece of the root of the same tree showed a number of slender stalk-like fungal outgrowths, which suggest the immature stalks of a *Xylaria*. They do not resemble those of *X. thwaitesii* which has been recorded as a parasite of *Hevea* rubber roots in Ceylon, and as almost all the other species of the genus are saprophytes and they are common on dead roots and wood in the tropics, the probabilities are that the fungus was growing as a saprophyte in this case. The roots were evidently dead for a considerable time. The sudden death may have been due to extension of a fungal rot from lateral roots to the collar and resulting "girdling" of the tree. I regret that it is not possible to identify the cause of the rot.

I am,

Sir,

Your obedient servant

(S) E. N. Butler

DIRECTOR.

The Director,
Department of Agriculture,
Seychelles.

126.

Department of Agriculture,
Seychelles, 7th September 1934.

Sir,

I am sending you by this mail a small box containing the following insects for identification and any recommendation regarding their control you may kindly be able to give me.

(1) Adults (in match box) caterpillars and chrysalids (in test tube 70% alcohol) of a moth, the caterpillars of which are proving very destructive of the leaves of young plants of *Eucalyptus citriodora*.

(2) Fly or scale insects found to be attacking the coconut palms on Cosmoledo Island.

I shall be grateful to have an early reply.

I am,
Sir,
Your obedient servant
(S) F. L. Squibbs.
DIRECTOR.

The Director
Imperial Institute of Entomology
London S. W. 7.

127.

Imperial Institute of Entomology,
London S.W.7, 15th February 1935.

Dear Sir,

I much regret the long delay in dealing with the insects sent with your letter of the 7th September 1934.

The moth has been identified for some time, but we have not yet succeeded in getting a name for the Aleurodid, which has had to be sent away to the only available specialist, who unfortunately can give very little time to the work of identification. I fear, therefore, that it may be some time yet before we can get a name for this insect.

I am returning a named specimen of the moth, *Simplicia inflexalis*, Guen. (family Noctuidæ), of which the British Museum would be glad to have a series in good condition when obtainable. I also send named specimens of a fly, *Tinda javana*, Macq. (family Stratiomyiidae) which was received a long time ago from Mr. Dupont.

Yours faithfully,
(S) Guy A.K. Marshall.
DIRECTOR.

The Director of Agriculture,
Seychelles.

128.

Imperial Institute of Entomology,
London S.W.7, 30th April 1935.

Dear Sir,

With further reference to your letter of the 7th September 1934, I have to inform you that the Coccid found attacking coconut palms on Cosmoledo Island has now been identified, and the name of the species is *Chionaspis* (*Phenacaspis*) *dilatata*, Green, of which *Chionaspis inday*, Banks is a synonym.

Yours faithfully,
(S) Guy A.K. Marshall.
DIRECTOR.

The Director of Agriculture,
Seychelles.

(g) *Plant importation and exchange.*

129. Over 25 separate consignments of seeds were received from abroad. These seeds covered a wide range and included many new timber trees for trial. Seeds and other specimens were sent to the following persons and institutions: Imperial Institute, Bureau of Mycology, Kew., Imperial Institute of Entomology, Professor L. H. Bailey, New York., Botanical Gardens, Peradeniya, Ceylon., Conservator of Forests, Mauritius., Director Coconuts Grove Aboretum, Florida., W. E. Blotch, Chicago.

(h) *Visit to Estates and Agricultural Instruction.*

130. The Director carried out many inspections of properties mortgaged to the Government. Visits by the Senior Officers of the Department to Estates in the Mahé and Praslin Group were made as frequently as was possible having regard to the additional work now undertaken and a reduced staff. Special

attention being given to advising planters concerning the planting and management of new crops. However it is realised that much more visiting and propaganda is required which can only be effectively carried out when trained assistance is forthcoming.

(i) *Correspondence and distribution of information in Agricultural matters.*

131. 1174 letters were despatched from the Department Office and 913 minute papers dealt with.

132. The following pamphlets were issued, (1) Onion cultivation, (2) Cropping and distillation of Eucalyptus Citriodora and Palmarosa, and copies of various reports were distributed to planters interested.

SECTION III.

(a) *Financial Statement.*

Receipts.

133. The Revenue consists of — :		
Receipts from plantations ...	...	Rs. 1,154.47
Sale of timber from Crown Lands ...	...	„ 199.94
Rent of Crown Lands and Buildings ...	...	„ 22,265.13
Royalty on Guano ...	...	„ 12,843.00
„ Timber from Aldabra Island ...	...	„ 141.93
		Rs. 36,604.47

Expenditure.

134. Agriculture Personal Emoluments and other Charges ...	...	Rs. 16,029.92
Forestry, Rivers and Crown Lands Reserve ...	...	„ 2,880.53
Upkeep Botanical and Public Gardens ...	...	„ 6,434.79
Destruction of Rats ...	...	„ 2,347.54
Passages ...	...	„ 1,215.80
		Rs. 28,908.58

135. Expenditure under Grants made from the Colonial Development Fund.

Fertilisers Experimental Plots ...	...	Rs. 3,397.44
Reafforestation ...	...	„ 421.44
		Rs. 3,818.88

(b) *Departmental changes of note.*

136. At the expiration of a 3 months' leave Mr. P. R. Dupont finally retired from the directorship of the Department on the 4th March and was succeeded in the post by the Assistant Director, Mr. F. L. Squibbs. Mr. Dupont was the first Curator of the Botanical Gardens to which post he was appointed in 1901 — Mr. Dupont left the Colony prior to retirement in 1923 and was afterwards appointed as Assistant Director to the Department of Agriculture in Mauritius in which capacity he served for a period of 20 months. He was then offered the directorship of the Department in this Colony to which he returned in 1924 on a special agreement.

137. The layout of the Botanical Gardens testifies to Mr. Dupont's skill in this direction and the successful introduction of its varied subjects were due to his enthusiastic care and devotion to his work.

138. During most of his service Mr. Dupont worked practically unaided. This no doubt served to restrict the Department's activities. However to have successfully shouldered all the responsibilities and functions of this varied Department for so many years is an achievement of which he may well be proud.

139. The Director was appointed in May as the Official Member to the Executive and Legislative Councils.

140. Mr. L. Hoarau was transferred as Clerk to the Department and replaced Mr. N. Carere.

141. The offices of the Department were transferred from the Old Hospital to the quarters in the Gardens occupied by the late Director.

142. The Director has pleasure in placing on record his appreciation of the willing cooperation and assistance rendered by the staff of the Department during the year.

(c) *Colonial Development Fund Grants.*

143. The following is a summary of the grants made during the year by the Colonial Development Fund Committee in response to applications prepared and submitted by the Department.

- (1). *Plant propagation.* Sum granted £1,000 covering a period of three years.

Date of approval of scheme, 20th September 1934.

Work commenced, 1st October 1934.

- (2). *Afforestation.* Sum granted £1,740 covering a period of three years.

Date of approval of scheme, 27th September 1934.

Work commenced, 15th October 1934.

- (3). *Visit of Sericulture Adviser.* Sum granted £150.

Date of approval of scheme, 26th September 1934.

Visit to take place in February 1935.

- (4). (a) *Erection of Laboratory.* Sum granted £150.

(b) Purchase of Chemicals and equipment £175.

Date of approval of scheme, November 1934.

144. Further applications for grants submitted by the Department were to provide for:—

- (1) Services of an Entomologist.
- (2) An Assistant Director.

SECTION IV.

(a) *Summary of legislative changes affecting agricultural and fishery industries during the year under review.*

145. Ordinance No. 2 of 1934 amends in two minor particulars the Bird's Eggs Close Season Ordinance (No. 7 of 1933).

146. Ordinances Nos. 11 and 25, controlling the export of Patchouli Oil were repealed and replaced by Ordinance No 6 of 1934. Proclamation No 18 of 1934 proclaims that the provisions of the Patchouli Oil Ordinance and the Regulations made thereunder shall apply to the following Essential Oils:—

- (1). Lemongrass (*Petite Citronelle*, *Cymbopogon Citratus*),
- (2). Palmarosa (*Cymbopogon Martinii*).
- (3). Citronella (*Cymbopogon Nardus*).
- (4). Cinnamon Bark (*Cinnamomum Zeylanicum*).

147. Ordinance No 13 of 1934 purports to effect the eradication of Ginger Grass and of Palmarosa plants of an inferior or hybrid quality in the Colony and to permit the planting of the true strain of Palmarosa in areas specified by the Agricultural Department.

(b) *Reafforestation.*

148. It is pleasing to record that assistance from the Colonial Development Fund by way of a free grant of £1,740, covering a period of three years, was secured for the benefit of afforestation. The grant of which the Colony was notified in October has been granted for two purposes.

(1) The sum of £560 to enable a Mountain reserve line to be surveyed and established in the Island of Mahé.

(2) The sum of £1,180 for the reafforestation of Crown lands on hill summits and slopes.

149. The serious situation which has arisen from the denundation of the higher lands in Mahé cannot be over emphasised. The danger of a fuel shortage for the essential oil distilleries and the harmful effects of soil erosion were the subject of cogent representations in the recent report of the essential oil Expert, Mr. Holdsworth Haines, and the report of the Department of Agriculture for the year 1932. The shortage of timber for constructional purposes would seem to loom ahead in the not far distant future.

150. To effect control of the cutting down and clearances which have proceeded unhindered on the higher mountain slopes, it was thought feasible to legislate on the lines laid down in the Mauritius Ordinance No. 13 of 1875, which prohibits the destruction of any tree within the reserves so established without due authority.

151. This part of the scheme has however met with a certain amount of local opposition. It is argued (1) that now most of the timber has been removed, the main object of the scheme has disappeared, (2) that erosion due to removal of trees is speedily checked by the rapid spread and blanketing effect of the bracken fern (*Gleichenia dichotoma*) and the grass (*Panicum Parviflorum*). Fortunately the main watershed and surrounding high lands situated in the central mountain area form part of the Crown Land reserves.

152. The reforestation part of the scheme is being energetically proceeded with.

153. Prior to the receipt of the grant, the money the Colony was able to afford for the work was largely used to pay watchmen who most of their time were occupied in patrolling and clearing boundaries, cleaning young plantations and insignificant plantings of young trees. In view of the great need for reforestation and the prospect of a grant being made, a new nursery was opened at the end of July on the Hermitage Estate as only 3 or 4 men could be spared for this work of collecting and sowing such seeds as became available.

154. On notification of the grant being made, additional labour was forthwith engaged. The opening of the Nursery area consisted of clearing the land of a few coconut and casuarina trees and boulders. The piece was enclosed with wire netting and main drains made. By the end of the year the whole area had been cleared, only a small portion remaining to be made into beds. Practically all beds were manured with such organic refuse, cinnamon leaves and stable manure as was available. The total lengths of beds ready by the end of the year was 5,950 feet of which 4,454 feet were sown.

155. As sowings were made as soon as the beds were completed, the quicker germinating species have in many cases reached a size for transplanting to permanent quarters.

156. *Pot Nursery.* A suitable structure has been erected to serve as a shelter for the finer seeds sown in boxes until germination has taken place and as a potting shed. Shaded and open stands for pot plants have also been prepared.

157. *Seeds sown.* Due care has been given to the great importance of selecting trees of proved utility having regard to (1) future timber requirements (2) suitability as forest covers and (3) their adaptability to the soil and climatic conditions of Seychelles. In order that this work may not be delayed seeds of these species possessing the above qualities obtainable locally were collected. Seeds of suitable timbers, especially the *Eucalyptii*, will be procured from abroad.

158. Seeds sown, of which the larger part have already germinated were:—

Local Name.

Jak	<i>Artocarpus integrifolia</i>
Badamier	<i>Terminalia Catappa</i>
Hazomena	<i>Khaya Madagascariensis</i>
Bois de table	<i>Heritiera littoralis</i>
Teak	<i>Tectona grandis</i>
Bois blanc	<i>Hernandia peltata</i>
Lilas	<i>Melia Azederach</i>
Mimosa	<i>Acacia confusa</i>
Cloves	<i>Eugenia caryophyllata</i>
Agati	<i>Adenanthera pavonina</i>
Bois noir	<i>Albizzia Lebbek</i>
Cedar	<i>Casuarina equisetifolia</i>
Santol	<i>Sandoricum indicum</i>
Takamaka Madagascar	<i>Calophyllum parviflorum</i>

Clearing of forest areas for planting.

159. *Niol area.* It was decided to commence clearing of land in the mountain forest area situated above the Niol reservoir. The land chosen had been almost completely denuded of trees and with the exception of a few Cinnamon bushes the bracken fern (*Gleichenia dichotoma*) was in complete possession, carpeting the land from 3 to 6 feet in depth. The permanent control of the growth of this rapacious fern is only effected by maintaining a shade canopy overhead as it does not thrive in shade. Once the shade is removed this fern quickly dominates and eventually strangles all undergrowth. Fern which has established itself for some years and which has accumulated a mass of dead stems beneath its top growth is effectively destroyed by being cut down fairly close to the ground and then rolled over. The fern dies and provides valuable humus and acts as a check to erosion of the newly cleared land for a considerable period.

160. A gang of men were engaged for this work in November and by the end of the year had cleared eight acres of land.

Plantings were also commenced and a number of *Albizia moluccana*, *Adenanthera pavonina* and *Eucalyptus citriodora* were set out.

161. It is arranged to have the cleared areas delimited and to follow as far as possible a definite planting plan.

In the new year fresh Nursery extensions are intended on the Hermitage Estate and a new nursery and forest clearings will be commenced on the Crown Lands in the Morne Blanc district.

162. Plants set out on Crown Lands prior to the work carried out under the Grant were as follows:—

Niol.	<i>Eucalyptus citriodora</i>	...	236
	<i>Cassia sp.</i>	...	60
	<i>Cacao</i>	...	135
	<i>Mahogany</i>	...	115
	<i>Eucalyptus Rostrata</i>	...	44
Dugand.	<i>Eucalyptus sp.</i> (local)	...	30
Hermitage }			
Estate }	<i>Calophyllum parviflorum</i>	...	48
Long Island Quarantine Station		...	401
Decorative plants miscellaneous		...	50
Total ...			1119

Coco de mer reserves Praslin.

163. In addition to the usual routine of maintenance, the fire barrier extending round the Reserves was widened during the year.

(c) *Fisheries.*

164. The following table shows the quantities of guano, fishery products and birds' eggs yolk exported from the Colony during the last five years:—

		1930.	1931.	1932.	1933.	1934.
Guano	... Tons	15,977	4,730	14,213	12,307	12,062
<i>Fishery products.</i>						
Calipee	... Kos.	4,120	4,186	5,743	4,788	3,878
Fish, fresh	...	...	...	...	...	...
„ salted	...	...	1,100	6,366	14,850	44,795
„ oil	...	...	...	800	...	...
Shark fins	...	1,095	1,433	1,178	...	1,413
„ meat	...	9,647	350	...	7,200	1,418
Tripangs	...	9,647	7,673	4,107	1,933	3,837
Turtle oil	... Lts.	4,225	...	4,500	700	400
„ strips	... Kos.	2,557	2,511	...	...	...

	1930.	1931.	1932.	1933.	1934.
Turtle shell Kos.	...	...	504	514	109
„ meat (dried)	...	...	2,337	1,680	751
Shark skins...	...	300	...	1,489	...
„ oil ... Lts.	...	170	...	...	...
Tortoise shell caret Kos.	1,323½	1,008	1,434	1,191	1,104
Birds' eggs yolk and albumen	70,300	95,750	55,240	57,400	49,900

165. A comparatively large increase in the export of salt fish is shown in the above table. Of the total of 44,795 kilos exported over 35,000 is given in the Customs as being exported to Hong Kong and the French Possessions. Considerable advance has been made in the technique of preparation and several hot air driers were erected or adapted during the past year, but the industry is struggling along without capital and in face of ever-increasing tariff barriers in all the neighbouring colonial markets such handicaps effectively serve to prohibit the development of the extensive fishing possibilities which are presumed to exist in the Archipelago.

166. An enquiry was addressed to the Fisheries Economist in Singapore as to the possibilities which might exist with regard to establishing a market for Seychelles fish in the Straits Settlements. Very helpful memoranda were received from this officer who further obliged by sending samples of dried fish as supplied to their market. The above was brought to the notice of those interested. Annual reports on Fisheries were requested and received from the respective Departments in New Zealand; New South Wales; Natal and the Straits Settlements.

167. The administrative control of the Fisheries Guard and Fisheries generally was transferred from the Department to the Port Office. The Fisheries Guard in charge of the reserves at Mahé took 51 contraventions and seized 106 fishing baskets (Casières) with undersized meshes during the year.

168. The following interesting daily and annual estimate of fish consumption in the Mahé Group was compiled from market records which were commenced in 1932 :—

1. Fresh fish consumed per day at Mahé Group :—

(a) Victoria	Tons.	1
(b) Praslin	„	$\frac{1}{2}$
(c) La Digue	„	$\frac{1}{4}$
(d) Country Districts	„	2

Total ... 1373 per annum.

2. Names and quantities of fish consumed under 1. above per annum :—

Mackerel (<i>Scomber c. Rupp.</i>)	Tons.	280
Carangue Balo (<i>Caranx g. Blkr.</i>)	„	195
Becune (<i>Sphyraena j. c. & V.</i>)	„	195
Cordonniers (<i>Teuthis o. Bloch</i>)	„	140
Baxous (<i>Lethrinus i. Rupp</i>)	„	1 0
Sharks	„	140
Various fish i.e. Cacatoï		
(<i>Pseudocaurus</i> sp.) Bourgeois (<i>Lutianus sebæ</i>),		
Vieille (<i>Epinephelus</i>),		
Gueule longue (<i>Lethrinus rostratus</i>),		
Capitaine rouge (<i>Lethrinus striatus</i>),		
Eclair (<i>Lethrinus karwa</i>),		
Varu-vara (<i>Lutianus civis</i>),		
Dame berry (<i>Lethrinus ramak</i>)		
and various carangues.		

280

3. Fresh fish consumed per annum at Islands of the Mahé Group :—

(a) Offshore fishing by lines	
from whale boats	Tons. 750
Offshore fishing by lines	
from pirogues	„ 300
(b) Inshore fishing by basket	
traps	„ 200
Inshore fishing by nets	„ 180

4. Fish whose habitat are mainly in the reserves are :—

Cordonniers, (*Teuthis oramin*), Bretons (*Geres acinaces*), mullet (*Mugil axillaris*), eclair (*Lethrinus karwa*), Sardines (*Sardinella sirm.*), Bait.

5. Migratory fish i.e. Carangues (*caranx*), mackerels and bonitos stay in these waters longer than in former years and are also caught at lesser distances from land. This can be partly attributed to the improvement of the feeding grounds situated in the vicinity of the reserves. The price of fish sold at Islands of the Mahé Group dropped by approximately 22% during 1934.

31st January, 1936.

(sd) F. L. SQUIBBS,
Director of Agriculture.

APPENDIX I

Monthly Rainfall taken at the Port Office, Victoria, 1914—1934.

	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	Monthly Mean Rainfall
January	14.99	8.82	9.31	12.93	24.18	18.02	32.63	15.80	5.93	19.31	12.60	25.25	10.77	7.84	16.72	13.19	6.18	11.16	15.13	16.96	12.85	14.74
February	9.85	26.22	7.17	10.12	4.64	11.94	5.95	13.36	1.78	14.29	1.85	13.65	15.85	.60	14.78	12.44	8.85	18.68	1.00	12.05	21.36	10.64
March	16.91	3.65	6.96	1.68	2.33	12.86	12.58	4.75	11.94	12.15	15.14	22.76	7.48	1.62	22.72	14.75	7.19	2.02	12.12	9.01	6.63	9.86
April	12.48	9.27	9.25	9.69	2.34	6.53	0.76	8.58	3.57	9.07	16.27	14.52	10.42	5.13	14.74	5.66	6.55	2.21	.93	7.00	4.16	7.58
May	9.46	6.01	8.06	0.45	2.92	13.42	6.66	7.66	5.73	8.17	4.93	5.70	16.26	6.71	15.64	3.78	3.51	9.80	5.53	6.01	5.65	7.29
June	2.45	2.82	4.29	1.09	0.95	9.25	3.50	1.20	4.10	4.47	3.42	1.16	15.94	7.24	2.69	.67	3.62	4.06	1.87	4.05	2.54	3.85
July	1.05	0.90	5.68	3.67	1.41	4.78	2.39	7.05	2.16	0.48	7.07	4.98	11.12	1.92	3.12	1.36	3.42	2.44	2.44	2.06	22.90	3.45
August	0.75	3.60	0.50	3.18	1.78	0.44	0.87	1.06	1.63	4.37	0.91	5.79	2.14	1.05	0.55	1.79	1.87	1.14	1.64	2.02	14.30	2.45
September	10.95	19.61	0.50	3.96	14.23	4.85	No Record.	0.32	4.69	6.93	8.13	5.35	.14	5.04	2.53	1.44	8.68	.14	4.14	5.07	23.25	6.28
October	10.88	9.14	1.13	0.45	9.14	5.05		2.34	9.91	15.35	12.24	10.79	4.49	14.09	1.83	3.24	2.11	8.41	12.65	5.00	4.84	6.8
November	8.03	10.88	4.40	6.94	8.92	1.23	7.84	7.84	1.88	8.85	10.75	15.58	7.52	5.36	10.23	5.17	20.59	5.78	5.97	9.05	8.53	7.83
December	11.25	14.96	10.18	12.06	9.95	12.66	15.20	16.11	3.50	8.10	15.05	8.77	20.89	10.59	28.80	10.94	13.25	29.30	10.18	13.05	18.05	13.93
Total	109.07	114.88	67.38	66.22	82.79	101.08	80.54	86.58	57.22	101.62	118.86	134.30	123.02	67.19	134.35	74.43	85.82	95.14	73.60	96.06	145.06	...

Average year = 95.93 inches

APPENDIX II.

1934.

Meteorological return for 1934.

Temperature. Rainfall. Wind.

Months.	Barometer Pressure in inch.	Solar Maximum.	Shade Maximum.	Shade Minimum.	Range.	Mean.	Amount in inches.	Relative Humidity %	Directions of Wind.	Average force.	Remarks.
January	30.037	126	81.2	76.1	5.1	78.6	12.85	77.6	NW	11.0	
February	30.045	128	82.4	76.9	5.6	79.6	21.36	76.8	NW	6.4	
March	30.038	132	83.5	77.6	5.9	80.5	6.63	74.0	NW	5.5	
April	30.053	134	85.6	78.8	6.8	82.2	4.16	67.0	ESE	4.7	
May	30.097	129	83.3	78.2	5.1	80.7	5.65	74.7	ESE	11.6	
June	30.094	119	80.6	78.5	2.1	79.5	2.54	80.0	ESE	17.8	
July	30.077	118	79.2	75.5	3.7	77.3	22.90	80.0	SE	17.5	
August	30.110	120	80.7	75.8	4.9	78.2	14.30	77.4	ESE	18.0	
September	30.104	124	80.9	76.1	4.8	78.5	23.25	78.8	ESE	15.3	
October	30.100	133	81.5	76.7	4.8	79.1	4.84	76.2	ESE	10.3	
November	30.077	136	82.7	76.6	6.1	79.6	8.53	78.9	NW	6.3	
December	30.051	134	82.7	76.0	6.7	79.3	18.05	80.2	NW	5.1	

